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WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

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FRENCH, BRITISH BIOTECHNOLOGY R&D REVIEWED

Huizen AARDE & KOSMOS in Dutch Nov/Dec 82 pp 602-603

[Article by John Beek: "News From Biotechnology"]

[Excerpts] All over the world, interest in biotechnology is growing. In the United States this has even led to a lot of little businesses that spring up out of the ground like toadstools and to what seem so far to be exaggerated expectations on the part of the business world. Not all of those little businesses are doing equally well. Possibly there is something other countries can learn from this.

French Aspirations

The French, too, want to share in all the blessings of biotechnology. Although France has several investigators of international stature (at the University of Strasbourg and at the Pasteur Institute in Paris), there is a crying need for microbiologists and molecular biologists. That is one of the weak points in Marianne's country that are indicated by Prof Pierre Douzou, microbiologist at the University of Paris. Douzou headed a commission that was appointed by the previous French cabinet to give an opinion on the prospects in the field of biotechnology. Its recommendations have been adopted by the Mitterand government and promises have been made. Only one exception has been made: the recommended amount has been made six times as large. That fits exactly into the present French policy of becoming a leading nation in the field of science and more especially technology. Minister Cevènement, who is seen in France as superminister for science and industrial renewal, realizes that money is needed if his country wants to maintain a reputation in the field of biotechnology in the future. Besides the weak point already mentioned there are other low points. There is a poor educational system for "genetic engineers," little attention is given to plant-cell biology, and for applications there are really minimal contacts between research institutions and industry. In the last few years methods in the antibiotics industry have been through a rapid development, and the French pharmaceutical industries have little experience with the new techniques in this field.

The laboratory research got somewhat one-sidedly developed, because the tendency was to concentrate on the use of standard laboratory species such as Escherichia

coli. The French scientific steering agency, CNRS [National Center for Scientific Research], wants to correct this development by establishing new groups of laboratories that will concern themselves with species such as Pseudomonas (a species of bacteria) or Actinomyces (a fungus). The CNRS also stands ready to draw appropriate figures from abroad to direct the research. It has also set aside some 40 million to 50 million francs for construction of a new laboratory where a hundred or so scientists can get down to work on biotechnology. First of all, in Douzou's view, the training must be improved. Also, the transfer of information from laboratory to industry must be done in a more efficient way. Lastly, Douzou sees great advantages in setting up a large number of small centers, where four or five researchers, assisted by a few analysts and technicians, undertake a specific study. The French authorities are coming to realize how big the investments in biotechnology must be. For that reason they want to enter into agreements and cooperative programs at the international level.

In France there are already specialized centers all over the country. Yet it appears that the Pasteur Institute in Paris will continue to play a leading part. Since World War II France has received only six Nobel Prizes, and three of them have gone to this institute. It is a shining example of a proper combination of basic research and industrial and medical applications. That combination can be traced to the aspirations of the founder, Louis Pasteur himself, who established the institute in 1888. Since that time it has played a prominent part in the production of vaccines, and now the steps toward transition to biotechnology are being taken equally seriously.

For external contacts and marketing, the institute consists of three subordinate parts. The "Institut Pasteur Production" is first to profit from promising developments. The second branch is the G3 group, which is supported by money from the institute itself and by the public authorities, among others. G3 stands for "Groupement Génie Génétique" [Genetic Engineering Group], and has as its objective developing commercial ideas itself and retailing them to industry under license. The third leg of the institute is active in making contacts with industry, from which the Pasteur Institute and biotechnological industry can both profit.

According to the American example, the Pasteur Institute will be followed by others. Medium-sized firms are springing up, financed in part by industry (e.g., the French oil company Elf) and partly by the universities. Besides the aforementioned G3 we find Genetica (partly owned by the chemical giant Rhône-Poulenc) and Transgène. The last mentioned has released something of its plans. It will be concerned with investigating the extent to which bacteria can recover minerals from sea water. There is also said to be an interest in working with plant cells. Furthermore, the CNRS at Strasbourg intends to set up a center for plant genetics. And Transgène is investigating what the possibilities are in food processing. That is an extensive field of application with little competition.

British To Clone Anti-Pain Hormone

Since retrenchments do not leave universities untouched, either, these temples of learning are more open than ever to cooperation with commercial enterprises. Especially in the growing field of biotechnology there are possibilities, if

only because industry can provide money that would not be there otherwise. That is true in the Netherlands, and certainly in England as well. The biochemistry department of University College, London, has concluded a contract with the firm of Endorphin, Inc., which was established in February 1982. The amount involved is about half a million guilders. Endorphin, Inc., is an American firm with headquarters at Seattle, Washington. Prof John Houck, president and director of the firm, has a patent on which the whole project is based. Houck had discovered that pancreatic tissue contains a hormone of great therapeutic promise. While the hormone has not yet been fully investigated, it appears to belong to the endorphin family and to be valuable chiefly as a painkiller. Endorphins alleviate physical pain directly in the brain. Most endorphins cannot reach the brain in their active form when they are administered, e.g., by injection. The newly discovered variant from pancreatic tissue can do so. Prof Brian Rabin and Dr Peter Butterworth of the London college are now working at cloning the hormone. Recombined bacteria with the gene for the hormone in question are expected to furnish a product that will be more usable for practical tests than if the hormone had to be produced from the pancreatic tissue of swine. Because of the severe retrenchments in England, the college no longer has the money to buy the very costly biochemical materials, such as restriction enzymes, ligases, and the like. For that reason Rabin and Butterworth say that they hope the contract with Endorphin will be followed by others. If the endorphin cloned by them eventually comes on the market, the college will get a 1-percent royalty on the sales.

Algae Farm for Pigment

Since even the consumer has become aware of the evil influence that artificial flavoring and coloring agents have on our bodies, food producers must pay more attention to what they mix into their wares. Researchers are looking for harmless substitutes, and sometimes such substitutes are found. One substitute coloring agent is beta carotene. Added in extremely minute amounts, this substance improves the appearance of foods. The world market for this synthetically produced molecule is estimated at 1,000 tons. At Pink Lake, on the west coast of Australia, Betacarotene Industries, Ltd., plans to start an "algae farm." It will cost the firm, whose headquarters are in Perth, 5.4 million Australian dollars. The plan is to obtain the coloring agent in question from a halophilic alga, Dunaliella salina. Betacarotene Industries has obtained a patent for that.

The alga occurs in abundance in Pink Lake, but still not great enough abundance for the Australian firm. For that reason the alga will first be cultivated in high concentration in salt water taken from Pink Lake. Then the actual production process can begin. The maximum production is estimated at 300 tons of beta carotene a year. A nutriment of high albumin content and glycerol occur as by-products. John Fogden, director of the project, considers that the strength of his product lies in the fact that it is a nautral coloring agent that can compete with artificial products. The expectation is that manufacture will be well under way by the end of 1983.

Biotechnology in the Netherlands

Biotechnology can be very useful in the Netherlands, especially in the field of plant breeding. We must not have extravagant hopes of it, however, according to

Prof Sneep of Wagening, who took his departure from the Landbouw Hogeschool [Agricultural University] last September. Biotechnology will become one of the techniques for plant improvement, but nothing more. Sneep also mentioned a current danger. Small American biotechnology firms in particular are trying to get patents on techniques of plant improvement some of which have existed for a long time. Troublesome problems can arise from this in the future.

8815
CSO: 3698/187

BIOTECHNOLOGY COMPANY FORMED IN SWEDEN

Paris CHIMIE ACTUALITES in French 15 Oct 82 p 3

["Article: Two Divisions for AC Biotechnics AB"--passages enclosed in slantlines printed in italics]

[Text] Malmo--The Swedish companies AB Cardo and Alfa Laval AB have officially announced the creation of a joint biotechnology subsidiary, AC Biotechnics AB (ACB), a creation that CHIMIE ACTUALITES had mentioned as early as last September 10 in its issue of that date (see p 12).

This 50/50 subsidiary, started with an initial capital of 50 million Swedish kronor, projects gross revenues of approximately 100 million kronor in its first year of operation.

The company will initially have two divisions: ACB Engineering which will develop and market complete biological processes for energy production and for the manufacturing of organic acids, of proteins produced by microorganisms and of pharmaceuticals; and ACB Specialty Chemicals, which will contract to make specific chemicals for leading pharmaceutical industries and specialty chemicals companies.

Cardo brings /"its experience in genetic technologies, microorganisms culture, fermentation and the production of chemicals through biological means as well as in scaling up processes to the industrial level"/. This/holding / group, which has investments in the sugar industry, in seeds, forestry and chemistry, had gross revenues of 2.4 billion kronor in 1981.

Alfa Laval (revenues: 7.3 billion kronor) specializes in the production of equipment and manufacturing processes for the daily, chemical food and fermentation industries.

Alfa Laval recently established a foothold in biotechnology with several new processes, including the / Biostil / process of continuous fermentation and distillation for an economical production of alcohol fuel from sugars or cereal-based mashes.

12260
CSO: 3698/154

COMPANY RECEIVES FUNDS FOR GENETIC RESEARCH OF POTATO STARCH

Rotterdam NRC HANDELSBLAD in Dutch 7 Feb 83 p 1

[Report by Roel Dijkhuis, NRC HANDELSBLAD correspondent]

[Text] Groningen, 7 Feb--With the support of the authorities, the potato starch company Avébé is going to try by genetic manipulation to grow a variety of potato that yields starch that is equivalent to cornstarch. At present 750,000 guilders has been made available for the purpose. This is being done within the framework of the integral structure plan for the north of the Netherlands.

Especially in the food sector so-called branched starch or amylopectin is an important raw material. This form of starch is present only in mixed form in potato starch. At very high costs the potato starch can sometimes be purified so that the branched form is suitable for use.

Cornstarch, however, yields amylopectin in almost pure form, and it is also much cheaper. Avébé has completely lost its share of the market in this sector to the cornstarch producers.

To win back that share and possibly expand it, Avébé, in collaboration with the TNO [Netherlands Central Organization for Applied Natural Scientific Research] experiment station for potato processing and the biotechnological center of the University of Groningen, wants to develop a variety of potato that contains only starch of the amylopectin type. That must be done by genetic manipulation.

"We are going to meddle at the DNA level in the potato," says Prof Dr B. Witholt of the National University of Groningen. He expects that the project will take a considerable time. An incidental advantage, according to Prof Witholt, is that it may also be possible to build other properties into the new potato race. He is thinking, for example, of resistance to potato blight.

8815
CSO: 3698/187

FRG RESEARCHERS DEVELOP NEW GENETIC ENGINEERING TECHNIQUE

Duesseldorf VDI NACHRICHTEN in German 12 Nov 82 p 28

[Article by D. Zimmermann: "Bacteria Produce Human Hormones"]

[Excerpts] Although at present Japan and the United States have a considerable lead over other industrial nations in various areas of biotechnology, it would be mistaken to expect news of successes only from those countries. Elsewhere as well noteworthy achievements are being made, for example in the laboratories of the Association for Biotechnology Research (GBF) in Stoeckheim near Braunschweig. It is here that in recent years the genetics section in particular has drawn attention to itself, such as through the development of the so-called cosmid method, for example, which could become an important tool in gene technology.

Bacteria Killers Transport DNA

For the injection of the DNA material into the bacterium, this method uses so-called bacteriophages. These viruses, which are only a small fraction of the size of a bacterium and which are completely harmless to people, are bacteria killers, as their name already signifies. They can attach themselves to a bacterium in relatively large numbers. The gene chain which is accommodated in their heads then pours out into the interior of the cell and uses the cellular apparatus for its own propagation. In this process, the bacterium perishes as a rule.

The prerequisite for the development of the cosmid technique was created by British scientists, who succeeded in removing the intrinsic DNA from the heads of bacteriophages, more precisely those of the bacteriophage named "lambda," and then filling them with foreign DNA. The Braunschweig gene technologists were then able to produce a sort of optimal transport plasmid. It is very short, so that it can accommodate much foreign DNA, and it contains above all a "cos" site. This could be called the "splice" site of the ring. It is the prerequisite for the plasmid being able to be incorporated by the bacteriophage head and later, after the bacteriophage attaches to the bacterium, for being injected by this into the new host cell.

The bacteriophage is thus used as a vehicle. Since aside from the plasmid forced upon it the bacteriophage does not contain any DNA which could be dangerous to the bacterium, the bacterium also does not suffer any damage because of this bacteriophage attack. The injected enlarged plasmid is thus propagated along with the

bacteria and can develop its intrinsic activities. Since the cosmid technique is still in its infancy, it is difficult to properly assess as yet the opportunities which it offers. For basic research, the analysis of genes and their arrangement on the DNA strands, it will undoubtedly assume great significance, and it is also likely to open up new and quite far-reaching possibilities in the sector of product preparation--the utilization of bacteria as chemical factories.

12114
CSO: 3698/223

MINISTER OUTLINES OBJECTIVES OF FRENCH ELECTRONICS INDUSTRY

Paris AFP SCIENCES in French 23 Sep 82 pp 1, 2

[Report on 16 Sep speech by Jean-Pierre Chevenement, French minister of research and industry: "Scientific Research Politics and Organization"--passages enclosed in slantlines appear underlined in the original text]

[Text] Paris / A three-pronged attack to meet the electronic challenge/ The electronics plan without which France would become a "satellite nation before the year 2000" hinges on three priorities /components, data processing and mass-distribution electronics /Mr Jean-Pierre Chevenement declared in Paris on September 16 when he announced the broad outlines of his plan of action.

Addressing several hundred employers who were attending the "Expansion Forum," the minister of research and industry gave himself some ambitious objectives on components. "Our plan of action," he said, "will lean at first on a vigorous research effort" on integrated-circuits, an area in which France must become self-sufficient, and also on video display techniques (flat screens) and on the mastering of ceramics techniques. The share of the French market for memories and microprocessors must rise from 16 to 100 percent by 1986.

Thomson will manufacture one million video recorders in 1986 under a license agreement, CII-Honeywell Bull (CII-HB) will diversify its activities and be the leader in micro-data-processing. At the same time Thomson, Matra and Saint-Gobain will have to consolidate in the components sector to form only two groups.

France will systematically tackle all the new products of the '90's (electronic games, video recorders, video cameras, personal computers, computerized communications, digital television). Within a month or so the government will announce the standards adopted for video recorders (Philips' V2.000, JVC's VHS or Sony's Betamax), a choice that implies agreements with Europe or Japan.

For micro-data processing, the Minister announced a consolidation of efforts around CII-HB who takes over the activities of SEMS, a Thomson subsidiary, and who will work in close cooperation with Transac-Alcatel,

a member of the CGE [General Power Company] group. By 1986, France must manufacture on its own 50 percent of its needs in this field, as opposed to almost 35 percent at this time.

In addition, CII-HB will expand its series of medium-power computers, the DPS-7, will intensify its participation in office automation and micro-data processing and will start working on applications such as computerized communications, engineering design and computer-assisted education.

The minister, who promised to publish a progress report every year, emphasized that France will be able to "pursue this offensive" only through an international cooperation--with a European priority. Nobody will be excluded; indeed France is ready to cooperate "with any partner who wishes to work towards the same objectives." he indicated.

The politics of "laisser-faire" as it was conducted before 1981 would lead to France's "electronics defeat" and would encourage the rise of a joint market domination by the United States and Japan who already control 62 percent of world electronics and data processing revenues. "Within five years, and in spite of a continuation of government subsidies at their past level, this would be the beginning of a process at the end of which France would be, before the year 2000, relegated to the rank of satellite nation in the new automated and computerized economy," Mr Chevenement concluded.

12260
CSO: 3698/156

MATRA-DATAVISION BOASTS INTERNATIONAL-SCALE CAD CAPABILITY

Paris ELECTRONIQUE ACTUALITES in French 17 Dec 82 pp 1, 5

/Article by G. Bidal: "An 'American Style' Progress, Matra-Datavision Moves Toward a Worldwide Dimension"/

> Thanks to a rather prestigious series of contracts, signed during these last few months, Matra-Datavision is well on the way to attaining its major objective, that is to figure among the greats of the CAD on a worldwide scale. And exportation will account for more than 50 percent in its 1982 CA /gross profit/, which will probably approach 30 million francs. After consolidating its positions in the principal European countries and establishing its first beachhead in the United States, the next target will be Japan, for the only French CAD company with an international dimension.

From 0.2 million francs in 1979, 2.2 million francs in 1980, and 8.1 million francs in 1981 to about 25 to 30 million francs projected for 1982, the Matra-Datavision gross profit is really showing an "American-style" progress, which confirms its predictions. And for 1983 it hopes to attain the 80-million-franc mark. Compared with the results of the great American manufacturing companies, these figures seems to be still quite modest. But one must stress the fact that such a comparison of Datavision in terms of the gross profit is misleading. The Matra subsidiary still essentially provides software products, even though it has begun to furnish computer hardware, and for some months has added to its total value by providing its own work stations, which, at present, it is building at a rate of eight per month. It would, however, have to raise its sales by three, four, or even five times in certain cases, to gain a valid comparison with its competitors, who, most of the time, include equipment sales in their totals. So, in this manner, Datavision claims second place in the French market, with a generated gross profit of 35 million francs.

But, of course, Datavision is most proud of its first results on the American market, first, with reference to the Westinghouse group, but also the first sale of a hardware system to Sippican, a manufacturer of lead buoys and radio-controlled submarines. The fact that American students are learning about CAD on the Euclid, because of a contract signed by Villanova University of Philadelphia, makes the company a little proud. Datavision also is expecting

at least three new orders in the United States by the end of the year, which would make a total of six to 8 orders for Datavision-U.S. in little more than six months of existence.

Another business deal for which they feel a legitimate pride at Datavision is the recent contract with the Volkswagen-Audi group in Germany for the sale of a Euclid system with six work stations. Among the latest orders, we should mention also the one from the Thyssen group in Germany. In Switzerland, CERN constitutes the main contact, followed by the order of the Omega watch-making group and the Ruech company, for a hardware system with Datavision work stations. Great Britain, which was the object of the first international efforts with the Euclid (Dowty, for example), has produced recent contracts with Marconi Avionics and Dunlop Aerospace. In Denmark, the CEData Company (building-engineering) has just bought its first system. In Italy, besides Aer Macchi, Datavision has just obtained contracts with Perini (machines for the paper industry) and especially with Elettronica San Giorgio (ELSAG), the biggest Italian manufacturer of computer control devices and industrial automation.

Japanese Subsidiary at the Beginning of 1983

The next step in this series of operations will be in Japan, with the opening of a subsidiary in this very promising country at the beginning of next year, although the extent of Japan's delayed interest in the use of CAD is less than has often been claimed. Some indiscreet remarks heard during the last SICOB /Exposition of Office and Business Supply Industries and Office Organization/ indicate that the first customer of Datavision could be the Nissan automobile group.

Optimism for the Future

And in France? The old adage "a prophet is never accepted in his own country" will be finally shown to be untrue, as shown by the recent acquisition of the Euclid by companies such as Potain, Sere-Bezu (SFIM), Matra-Horlogerie (first order from that group since Datavision became part of Matra), and CNES (National Center for Space Studies). Let us also take note of the recent entry of the Euclid into the universities, laboratories, and training centers: LAAS in Toulouse, the Ecole Centrale in Lyons, IDN, ENSAM, the University of Valenciennes, and AFP (Professional Training Association) in Mans, which will no doubt be the best equipped French training center for the CAD.

So, Datavision can look into the future with optimism, since the company will soon employ 90 people. And, looking back, they can congratulate themselves for becoming part of the Matra group which has, above all, offered the necessary financial back-up to now. The group, no doubt, also offers a favorable environment for their robotics projects--let us remember that Matra was chosen by the government, with the CGE, as a national robotics center--and for possible synergies with other competencies of Matra, such as optics, image processing, or mechanics, for example.

However, remember that Datavision has remained largely autonomous up to now, and, except for a collaboration with the optical division for the production of a work station proposed by the company, and some commercial assistance, the incorporation of its objectives into a total strategy in the automation-robotics sphere has not yet visibly taken place. It is not even certain that this is desirable on either side, because if the CAD-robotics connection is really planned for the future, it still will be a question of commercially separated areas. For Datavision, the final objective is simple, sell CAD and nothing but CAD.

12230
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DANISH FIRM INTRODUCES WORLD'S LARGEST MICRO-BASED COMPUTER

Copenhagen BERLINGSKE TIDENDE in Danish 31 Jan 83 p 5

[Article by Erik Bendt Rasmussen]

[Text] Dansk Data Elektronik, which was started by a group of engineers from the Technical University of Denmark, introduces the world's largest micro-based computer.

A new Danish micro-based computer industry is developing at full speed. It is a young enterprise, Dansk Data Elektronik at Herlev. Its achievements have attracted attention, and the firm has got quite an impressive list of customers. A super micro-based computer, the Unimax, was introduced at the Mikro Data 83 fair at the Bella Center, and the Danish State Railways have placed the first order. The price ranges from 150,000 kroner to 3 million kroner, depending on the capacity of the computer.

The history behind Dansk Data Elektronik is exciting. In 1975, six young engineers at the Technical University of Denmark became aware of the vast future for micro-based computers and decided to develop a micro-based computer for commercial usage. Their aim was to start their own manufacturing company. The road went via small micro-based computers, and the development has, for the time being, culminated with the Unimax. The prototype was shown in Las Vegas and attracted attention. Unimax is the world's largest micro-based computer, and what would be more natural than showing it in the United States.

Started on Dining Table

"In the spring of 1975 we developed the idea for the first micro-based computer. We were well equipped with knowledge from the Technical University of Denmark, and, in the fall, we started our producing company with an initial capital of 30,000 kroner," says Claus Erik Christoffersen, director, who was one of the six engineers.

Of the group, four remain today as proprietors of the company, viz. Claus Erik Christoffersen, Ole Lading, Tom Hertz, and Knud Arne Nielsen. The first experiments in connection with the development of their micro-based computer took place on the dining table in Ole Lading's home.

"The initial capital made it possible for us to pay for the materials for the first micro-based computer, which was purchased by the Technical University of Denmark for its alarm system. And then we got money to build still another micro-based computer," says Claus Erik Christoffersen. "We did not draw any salaries. We worked free for our own firm."

Industrial Production

However, in the spring of 1976, the new firm, Dansk Data Elektronik, was doing so well that they were able to rent factory premises at Herlev and start hiring coworkers at a modest rate. The firm did not use any form of marketing or advertising. The micro-based computers were sold by word of mouth.

The first model was called ID 7000 and, because the engineers were graduates of the Technical University of Denmark, the computer was designed for data control and process control in industrial enterprises. However, the team of engineers took a look at the future and were able to foresee that the so-called "small, professional computer," a computer placed next to or on the desk, would have great prospects.

"That became the start signal for the development of the next micro-based computer, which we called SPC/1, which means Small Professional Computer System. And with that model we shifted toward the administrative field, where we were able to see that there would be a vast demand for micro-based computers. We have to this date sold approximately 1,400 SPC/L computers."

Many Micro-Based Computers Sold

The micro-based computers of Dansk Data Elektronik are used in the control system of the Strandvej Gasworks.

The Postal and Telegraph Services have placed an order for 125 micro-based computers for control of the radio link systems throughout the country of the Postal and Telegraph Services.

The Copenhagen Water Supply Company has purchased 8 micro-based computers for data control of the water consumption and water supply in the metropolitan area.

Product Needs No Comment

A total number of 70 micro-based computers has been delivered to the Technical University of Denmark for temperature control in all of the buildings in order for no heating to be wasted on house sparrows.

"We started with an annual turnover of 167,000 kroner and are now close to 50 million kroner, and we have been providing our own capital for several years. We have experienced amazing increases in our turnover, but the only reason why we have been successful is that we have known that we would have to make our own money for research and development. We have also been aware of the fact that we could not survive on mass production. And because we have been a small

group of owners joined together, we have been able to take our time for new thinking," says Claus Erik Christoffersen.

To the owners of Dansk Data Elektronik, 'the Writing on the Wall' has all the time been saying that the company will have to create unique products calculated to attract attention without any advertising activities. Claus Erik Christoffersen says that he is quite aware of the fact that the company does not have the budget for advertising of a large company, and that it, therefore, is important for a new product to speak for itself.

Director's Personal Micro-Based Computer

"Of course, it involves hard work on the part of all of our groups of co-workers, and that is why, despite our small number of 70 employees, we have been divided into departments, each of which has its own budget and accounts. It goes without saying that our company, to a high degree, goes in for data control of economic matters, and that is why we have approximately 50 of our own SPC/1 computers in operation internally and some coupled to screens."

Next to the desk of Director Claus Erik Christoffersen is a SPC/1 computer. From here, Claus Erik Christoffersen is able to follow the operation of the company on a daily basis. It is his personal computer. He uses it daily for liquidity and budget control, sales statistics and planning.

"On account of our vast sales of SPC/1, we were able to afford realizing our dream of the future: the world's largest micro-based computer, which we called Unimax. Fully expanded, it may be coupled to 128 screen terminals. A customer may start with a small edition, and as his need for data processing programs increases, we may add an increasing number of processing units to his Unimax. It is no more difficult than filing a piece of paper."

Unimax, a Large Micro-Based Computer

For the benefit of EDP experts it is pointed out that Unimax may have at its disposal a total accumulation of data of approximately 128 million signs and may be provided with a background storage capacity of more than 10 billion signs.

Dansk Data Elektronik also works within the fields of design and production of special wholesale micro-based computers. The company is, among other things, subsupplier of micro-based computers for other enterprises which sell micro-based computers with screens and keyboards.

"But, in the main, we intend to continue concentrating on the professional computer market. We gather knowledge of new trends and technology through frequent visits to international exhibitions and with international producers," says Claus Erik Christoffersen. "And we spend considerable sums of money on product development. In addition, we pay ourselves all of our product development costs and write them off immediately. We are independent, we can manage on our own, and we are not for sale. We have bought and worn our children's shoes for our own account and risk, and we have now changed to adult sizes within our branch of the industry.

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CSO: 3698/188

MIKRON DEVELOPS, MANUFACTURES GATE ARRAYS, HYBRIDS, PC BOARDS

Essen ELEKTRONIK-APPLIKATION in German Nov 82 pp 26-28

[Text] The Kontron group is setting out on a new activity: Together with its offering of in-house CAD [computer-aided design] assistance, the Mikron division is developing and manufacturing printed circuit boards, hybrid circuits, and now also gate arrays. In the near future, gate arrays are to be metalized within the company as well.

Kontron has been manufacturing PC boards since 1978. After its plant burned down in August 1981, at first a portion of the manufacturing was farmed out, and also within a week a standby production was set up to fill the most important orders.

Then over the winter of 1981/82, Kontron constructed a new building at the same site. This building is to house interlinking technologies, according to Christian Lehmann, manager of Mikron. These interlinking technologies are based on CAD and include the analysis and manufacturing of PC boards and multilayer boards (up to 12 layers by the middle of 1983), hybrid circuits in thick-film and thin-film technology (HF), as well as the development of gate arrays.

Gate Arrays

Lehmann is devoting special attention to the sector of gate arrays: In this connection, the fabricating of the final mask, the metalization plane, is to be taken over by the company's own manufacturing facilities from mid-1983 on. For especially critical applications, the firm intends to install later an E-beam system for direct tracing on the wafer. The semiconductor producers from which Mikron previously obtained prefabricated gate arrays and which still carry out the metalization are to function later merely as silicon foundries. At present, gate arrays are being made available by the firms of AMI, SC-Alcatel, and Telmos. Contracts with other semiconductor manufacturers are in the final stages of realization.

Furthermore, there are plans for the in-house development of a gate-array family in Si-gate CMOS technology with single-layer wiring. These gate arrays are to permit high clock frequencies as well as the optimal employment of existing CAD techniques.

Moreover, a few months ago Kontron/Mikron acquired, as its own "silicon foundry," the firm of SDI (of Massachusetts), which has a manufacturing capacity of more

than 1,000 wafers/day and which also makes available for outside customers epitactic raw material for HMOS, VMOS, and other manufacturing technologies.

Hybrid Circuits

On the basis of customers' circuit diagrams, thick-film circuits are being made inclusive of testing. The circuit resolution is done in an in-house CAD center. Patterns are generally ready for shipment after 3 weeks.

Mikron likewise is offering customer-specific band circuits on the basis of Al_2O_3 thick-film circuits, in connection with which the chips are bonded on the substrate in place of housed IC's.

PC Boards

As a fundamental technique, CAD also plays a prominent role in PC-board and multilayer manufacturing.

The digitalizing of customers' circuits is possible, as is an analysis via autorouter (98 percent). Data tapes supplied by the customer are plotted and the films are delivered within 24 hours. Reresolutions are done within a calendar week.

With the use of commonly-fabricated bases, Mikron makes PC-board patterns within 24 hours. For mass-production runs, an initial-run time of up to 4 weeks is indicated. Multilayer patterns are available within a calendar week, and mass-production runs after 4 to 6 weeks.

CAD Assistance

Capital expenditures of more than DM 2 million in CAD system components, such as a VAX-11/780 and some PDP 11/34's and Applicon AGS 895's, which constitute the core of the development center, are helping in the analysis and manufacturing process with respect to PC boards, multilayer boards, hybrid circuits, and gate arrays. The self-developed software called Micad is an aid to simulation, placement, and routing, and it includes also the necessary postprocessing.

Micad, which has been implemented on the VAX up to now, is supposed to be run also on a low-cost stand-alone system directly at the work station in the future. Such a system is being shown at the "Electronica 82" exhibition.

As its target for 1983, Mikron has plans for about six multilayer and two gate array developments per week.

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BRIEFS

ELECTRONICS INDUSTRY PROJECTS LAUNCHED--Eight Electronics Industry Projects To Be Launched Within Two Months--The electronics industry's national committee is being organized. Under the chairmanship of Mr Chevenement, the minister of research and industry, the committee has just appointed two vice-presidents, Messrs Farnoux (the author of the report that bears his name) and Boudeville (vice-president and chief executive officer of TRT [Telecommunications, Radioelectricity and Telephone Company], and an executive secretary, Mr Levieux (assistant to the director of the INRIA [National Institute of Industrial Atomic Research]). The committee will implement 16 projects described in the Farnoux report, including eight priority ones that will be launched within two months. These are the projects on elementary modules, mass-distribution electronics, video displays, computer-assisted education, computer-assisted design of highly-integrated circuits, computer-assisted manufacturing, computer-assisted translation, and software. These industry-mobilizing projects will have at their disposal research funds amounting to Fr 1280 million for this year and Fr 1612 million in 1983. Among the main participants let us mention, in addition to the industrial companies Thomson, CII-HB [CII-Honeywell Bull] and CGE [French General Electric Company], the CNRS [National Center for Scientific Research], the INRIA, the CEA [Atomic Energy Commission], the ADI [Association for the Development of Data Processing] and the INRA [National Institute of Atomic Research]. [Text] [Paris ELECTRONIQUE ACTUALITIES in French 17 Dec 82 p 3] 12260

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INDUSTRIAL TECHNOLOGY

FRANCE ANNOUNCES NATIONAL MATERIALS-DEVELOPMENT PROGRAM

Reasons for Decision

Paris LES ECHOS in French 30 Nov 82 p 11

[Article by Jacqueline Mattei]

[Text] Tomorrow, optical fibers in telecommunications, composites used in automobiles, ceramics and superconductive materials for nuclear fusion, and amorphous materials for "bubble" computer memories. This is barely science fiction. Right now, carbon fiber is beginning to be used in automobiles, ceramics are being used in pipes for continuous casting and in prostheses.

Japan's MITI [Ministry of International Trade and Industry] has inventoried all the potential uses of these new materials which are going to revolutionize the future (see the table on the next page) and has begun a major research program covering a 10-year period.

France does not want to be left behind. Jean-Pierre Chevenement recently announced the start of a top-priority research program on new materials.

Now attention must be given to encouraging the development of industrial operators. These may come from the major users of such materials (automobile and aircraft manufacturers) and the makers of traditional materials (glass, wood, steel, aluminum, plastics). The battle for the mastery of these new materials promises to be a harsh one.

The Potential Field of Action

Energy:	
Uranium enrichment	Carbon fibers
New types of reactors	Heat-resistant alloys, ceramics
Nuclear fusion	Superconductive materials, ceramics
Coal liquefaction	Anti-corrosion alloys, ceramics
Assisted petroleum recovery	Water-soluble macromolecules
Solar energy	Separation diaphragms, amorphous materials
Sea energy	Highly anticorrosive alloys, fiber-reinforced plastics, hard cement
Energy conservation	Amorphous materials, Heat-resistant ceramic alloys
Consumer Goods:	
Video, home computers	Optical fibers, Light-sensitive macromolecules
Medical equipment (artificial heart and valves)	Macromolecular diaphragms compatible with living organisms, very light alloys
X-ray diagnosis	Carbon fibers
Environment (treatment of effluents, desulfurisation)	Separation diaphragm, anti-corrosive alloys
Transportation	Very light alloys, composite materials
Heavy Equipment:	
Machine tools, robotics	Ceramics, composite materials
Communication equipment	Optical fibers, conductive macromolecules
Office equipment (bubble memory, optical memories)	Amorphous materials, light-sensitive macromolecules, technical plastics

The Government Wants to Encourage the Development of "Industrial Operators"

Beginning a priority research program on materials is good. But convincing business to include the "materials" concept in their industrial strategy is even better. In addition to the measures that have been announced to galvanize research on new materials, Jean-Pierre Chevenement wants to encourage within French enterprise, with the national groups in the lead, the development of large industrial operators.

There are two reasons behind this intention. The first is that there can be no major research policy in this field without a well defined marketing policy. In the past, there was no large-scale research being done in France on carbon fibers before Elf-Aquitaine and PUK [Pechiney-Ugine-Kuhlmann] got involved in industrial applications. And today, the lack of production in France limits the interest in research on aramid fibers.

The second reason is that the development of new materials is too important a matter to be left in the hands of the users. Space, aviation, and defense, because of their requirements, do encourage technical progress in the first phase. In a later phase, they tend to stagnate progress. The major technological programs act as a stimulant for the development of new materials, so long as the selection has not been definitely made. But once a given program is approved, any later evolution becomes impossible, acting in the name of reliability and safety.

This is a new philosophy. It is not the SNIAS [National Industrial Aerospace Company] or Renault which will determine what will be in the field of composite materials. Nor will Thomson or Matra have the decisive say in products for electronics. Now materials specialists will have to take their own destiny in hand, though certainly they will continue to work with the users of these materials.

To do this, the minister of industry is counting on national enterprises. In the planning contracts for some of these enterprises--contracts which will spell out with precision the major duties and commitments of each group--the "materials" concept will now be included.

"A Natural Extension"

PUK anticipated this government decision. Last June it set up a "new materials and metals division." According to Pechiney, "this is not a diversification, but rather a natural extension, since the group's activity is based on a fairly new metal, aluminum," said Mr Armand, director of this division, which for the moment is quite small in terms of sales. Their working agenda includes composite materials, ceramics, and strategic metals for the military and civilian sectors (titanium and zirconium).

Another key component of the new materials strategy is Elf-Aquitaine. In addition to its association with Toray for the production of carbon fibers, this group wants to expand its co-operation with the Japanese to include composite materials and perhaps to fine chemistry (resins for electronics, products for assisted recovery operations).

There is also Rhone-Poulenc, a strong contender in technical polymers, with a sales volume of 2 billion francs, but which is now taking some time out to think about its future developments.

Then there are the somewhat smaller firms, such as the National Propellants and Explosives Company. And we should not forget the major users in aviation (SNIAS and SEP [European Propulsion Company]) and automobile manufacturers such as Peugeot and Renault.

Reawakening the Traditional Sectors

In discussing these group policies, it would be misleading to erect an impassable barrier between new materials and traditional materials. A striking illustration of their interconnection is the Saint-Gobain group which is pursuing a strategy oriented both toward the development of entirely new products (optical fibers) and toward developments in conventional products: lightened glass for packaging, thermal glass to be used for housing (this glass allows solar energy to travel in only a single direction).

In the latter field, Saint-Gobain is now studying continuous and discontinuous production methods, and is beginning production for field tests. They hope to begin commercial sales in 1983.

The competition from new materials is reawakening some of the traditional sectors, including wood and steel. Mr Raymond

Levy, the president of Usinor, is getting ready to "try to win back the production of the hatchback for the Citroen BX." And why not get involved in public works as well? "France uses too much concrete; steel could replace it." That is a matter of changing steels, and that would mean revitalizing research. In this sense, any changing material is something new.

There are apparently a great many competitors standing ready on the starting line. The government's interest has dynamized these enterprises. But how many will make it to the finish line? The industrial map of new materials--with some major strong points and quite a few gaps--remains to be completed.

Major Fields of Effort

Paris LES ECHOS in French 30 Nov 82 p 12

[Article by Jacqueline Mattei and Jean Pellandini]

[Text] Two years ago Japan began a "basic industrial technologies development program for the next generation" (the 1990 horizon). Among the 12 topics there are three on bio-technologies and nine on new materials (composites, fine ceramics, macro-crystalline polymers, and high-performance metal alloys). The total funding envelope is 104 billion yen (2.7 billion francs) to be used to aid research in groups such as Toray, Asahi Glass, Nippon Carbon, Teijin, Mitsubishi, Sumitomo, and Kyoto Ceramics. Further aid is also expected for industrial investments.

France should not allow itself to fall behind. For the priority program on materials the Jean-Pierre Causse report calls for funding of 1 billion francs spread over 3 years. The report proposes to emphasize some high-tech areas: composites, technical polymers, ceramics, materials for electronics, and amorphous materials. France's position in these various fields differs a great deal.

A good example of the materials policy is composites. And the most striking branch of composites is carbon fibers. At the end of 1980, there was a growing realization that France was absent from the field of carbon fibers. Spurred on by successive administrations which maintained excellent continuity in urging an alliance with leading world specialists, PUK joined forces with the U.S. firm, Hercules, and Elf-Aquitaine began to work with the Japanese company, Toray.

Room for Three European Manufacturers

A paradox has been created in this area: there is now a certain amount of disillusionment being felt by the two companies. For some time, each felt it was the only one in the field. Elf was the first to begin negotiations, but PUK was the first to reach an agreement. Today there is an overabundance: The PUK/Hercules plant at Pont-de-Claix will produce 200 tons a year at the end of 1983, and the Elf/Toray plant at Lacq will produce 300 tons a year starting at the end of 1984. So in the first phase (expansions are scheduled later) there will be a capacity of 500 tons a year, while the French market in 1982 was about 100 tons, and the world market was at most 1,500 tons.

For the time being, there hardly seems to be room in Europe for three producers (for we also have to include the British firm, Courtaulds). However, "we must have confidence in the ability of these new techniques to create new markets," answers Jean-Pierre Chevenement. If the automobile market opens up, that will immediately multiply demand by a factor of 3.

Carbon fibers are the most spectacular of the composite materials, but are actually the smallest in terms of tonnage. The biggest item in terms of consumption in this field is glass fibers (800,000 tons in the world, 250,000 tons in Europe, and 50,000 tons in France). In theory, France's position in glass fibers is a good one: Vetrotex (Saint-Gobain) is the largest producer in Europe. But its books are in the red: the determined competition from about 15 manufacturers is causing very unprofitable prices.

Because of that, investments and research have slowed down. But in order to hold its position, glass fiber must improve its performance, which means that research must be reinvigorated. "If the government wants Vetrotex to remain the European leader, they will have to help it to get through these financial hard times," says Jean-Pierre Causse, director of research at Saint-Gobain.

One big lack in France is work on aramid fiber (there is a production capacity of about 10,000 tons in the world). Until the present Du Pont de Nemours, using the tradename Kevlar, has held a monopoly. But the Dutch firm, Enka, is now getting into this field, and some of the Japanese (Teijin and Toray) are thinking of it.

France would like to encourage the development of some competence in these fields, either on current techniques, or even better, on new techniques. Some possible operators are Elf, PUK, and Rhone-Poulenc (which did some research in this area, but stopped it in 1978). But the starting signal has not yet been given.

High-Performance Resins

Another aspect of the composite materials problem is the development of high-performance resins, which act as matrices for polyester fibers, polyamide, and epoxy. But that is getting into the area of technical polymers. Another related area is adhesives. The SNPE [National Propellants and Explosives Company] at the end of September signed a licensing agreement with the Hysol division of the U.S. firm, Dexter, for a line of adhesives to be used in the aeronautic market.

In the end, everything can be a matrix for composite materials: ceramics (reinforced with fibers), metal alloys (PUK is working on aluminum/carbon fiber blends), carbon (Lorraine Carbon is developing carbon fiber/carbon composites).

Although technical plastics are not exactly in everyday use by the general public, there is still a distinction that must be made between the "big" technical plastics (whose tonnage is counted in tens of thousands of tons) and very high-tech plastics (several hundred tons).

The Five "Big" Technical Plastics

There are five major technical plastics. These are generally dominated by one or more leaders in terms of the world market. France's strategy is designed mainly to consolidate the terrain already won in this area.

France's strong point is the field of polyamides, which by themselves make up 60 percent of the technical plastics; Rhone-Poulenc is in second place in Europe behind BASF. ATO also produces polyamides and is getting into a polyether-amide (Pebax). In the field of polyesters, there is a poorly dominated abundance of supply with three producers: PCUK, Choe, and CdF-Chimie [French Coal Company-Chemistry Division], and the chemistry plan calls for a regrouping of industrial forces under the leadership of CdF-Chimie. Another important variety is terephtalate polyesters (thermoplastics). Rhone-Poulenc has been interested in these for the past 2 years.

France's weak points include: polycarbonate, for which the German firm, Bayer, is the reigning world leader; and polyacetal, which is dominated by Du Pont and the Hoechst-Celanese, and BASF-Degussa associations.

Other technical polymers include: fluoride-treated plastics which Elf-Aquitaine is going to take over from PCUK; silicones, for which eight manufacturers share the world market, with Dow Corning in the lead (Rhone-Poulenc is the leading European producer); and latex, whose binding properties are used for attaching papers and non-woven materials (Rhone-Poulenc is the only producer in France, and one of the four world leaders, along with Dow Chemical, BASF, and Hoechst (which also has a manufacturing operation in France).

Electronics and Ceramics

Another product is epoxy, where CdF-Chimie's attempts have been slowed down by the market's surplus production capacity (dominated by Shell, Dow, and Ciba-Geigy). There are also polyamides, where Rhone-Poulenc moved slowly for a long time because it initially positioned its product poorly, aiming at too broad a range of applications, but where it finally found its niche in materials for space. Other qualities are produced by the Japanese and Americans (Du Pont, Amaco, Union Carbide, and Phillips Petroleum).

We should also mention that the U.S. subsidiary of Elf-Aquitaine, M and T Chemicals, is also interested in polyamides and is doing studies on the procedure with the Lacq research center. The two partners are preparing to begin a very small-scale production to test the market (in particular, the electronics market). Like epoxy, polyamides can serve as a matrix for composites, but they can also be used in materials for electronics.

The same trend appears in electronics as in other sectors; while active components remain a part of electronics, for various elements of passive components (polymer and ceramics) the government would like the specialists who deal with these materials to dominate research and production.

Electronics is one of the applications of technical ceramics. But here again a distinction must be made between products designed for mass consumption (such as household appliances) and specialty items. Here the markets (in ceramics, electricity, and piezo-electricity) are very fragmented and have various phases of production (powders, semi-finished fibers, parts).

The field of technical ceramics is a new and growing one, in which the Japanese are taking a keen interest: the world leader is Kyoto Ceramics, which specializes in ceramics for technical uses. Its sales are about 2.5 billion francs. In France, the makers of technical ceramics are Lafarge and Ceraver (CGE [General Electric Company]) which has signed a letter of intent to regroup its forces with those of LCC [expansion unknown] (Thomson). Then there are also small firms such as Isolantit working in this field.

The users are maintaining a key role. Research is now underway with Peugeot and Renault on high-temperature thermal shields which can increase engine efficiency.

PUK produces ceramics through its U.S. subsidiary, HTC, but has not yet decided to make them in France. Because of marketing difficulties, the applications of these ceramics are worldwide, but each market by itself is small. Among the companies making powders, Le Rubis Synthetique des Alpes (the sole heir of PCUK which PUK wanted to keep) is one of the world leaders in alumina powder.

The final axis of research is amorphous materials. These are non-crystalline materials (very rapid cooling from high temperatures prevents crystallization). Amorphous silicon is used for solar cells. There are also amorphous metals, which the Japanese are using in electrical transformers.

Pont-a-Mousson is working on amorphous nonferrous metal materials. PUK is continuing its work on amorphous aluminum alloys. Usinor has begun working with the Polytechnical Institute of Grenoble to produce amorphous metal sheets.

Space Odyssey: Orbital Factories

We are accustomed to using every day materials that now seem ordinary to us: paper, glass, a variety of metals, plastics, etc. But the latter products are the result of chemical research spanning over 4 decades, and which is still continuing today in order to develop new materials or new methods for their use. The world of polymers is far from having discovered all the potential of the chemical arsenal, and we can still expect many surprises in this field.

But going beyond these developments in techniques that now seem traditional to us, during the next few decades we should expect to see the appearance of a considerable number of new materials

which will revolutionize both industrial techniques and everyday life. But where will these new materials come from? Some of them will come from factories located in space.

The Coming of Optical Fibers

The preparation of some products in a state of zero gravity may give them new physical or chemical properties. This is particularly true of metal alloys (some of which can not be made on earth with a satisfactory homogeneity), medications (by increasing in considerable proportions the efficiency of some reactions), or products for micro-electronics (making it possible to develop very pure products which are needed for electronic devices with a very high degree of integration.

However, at least before real orbital factories are located in space, only minute quantities of materials can be produced in these conditions. This will mean that preparation techniques used on earth will also undergo some significant changes.

Remaining in the field of electronics, after the reign of germanium, silicon came along. That material will in turn be eclipsed by new products, such as gallium arsenide (AsGa) and some other "III-V" compounds, which are so called because they belong to classes III and V of the Mendeleyev chemical classification.

At the same time, new photosensitive resins are being developed for the production of high-precision electronic microcircuits, and glass is going outside its traditional domain to enter the field of telecommunications with optical fibers, the base elements for the future multiservice systems (telephone, computers, television, etc.) which will enable people to communicate. New materials are also in the process of development now (including liquid crystals) to be used for making flat display screens for television and computers.

The aerospace industry and a number of other high-tech industries have stimulated the development of a great many composite materials, including the well known carbon-carbon materials, which are beginning to find outlets in many new industrial applications. Some of these materials may even be able to compete with some metals, even steel, in some of their normal uses: structural elements for aircraft or satellites, or pipes for petroleum exploration and extraction are some of these uses.

The Time of Ceramics is Coming

Another interesting technological orientation of great promise is the field of superconductive materials. These are materials which, when brought to very low temperatures (between 1° and 10° K) offer no resistance to the passage of electricity, and which thus eliminate, or at least greatly decrease, calorific losses in electrical materials.

While we will not be able to transmit electricity with no losses over great distances in the near future, these materials can be used for some electrical production equipment, such as alternators. Several cryo-alternator projects are now being conducted in a number of places throughout the world, and there are two such projects in France.

Current research is now concentrating on two major areas: on superconductive materials at higher temperatures (the ideal would be to find materials with superconductive properties at ambient temperature); and on organic superconductors. In this area, French research has recently produced some encouraging results.

Among all the centers of interest in the field of new materials, special mention should be given to ceramics. The current developments, combining sintering techniques and composite materials, such as short fibers, are very promising. In some cases, it is possible to produce glass that bends as easily as metal.

In other cases, it is possible to produce materials that are much more shock-resistant than steel, or products that have a strong resistance to wear. The automobile engines of the future, both light and economical in terms of fuel consumption, may be made of ceramic materials.

Even biology may provide a source of new materials or a technique for improving traditional materials. Certain bacteria are capable of refining some metal ores, while others can provide new chains of molecules and help to produce a new generation of plastics. These plastics would be made in huge biological fermentation facilities, as some medications are already being produced.

For all these reasons, we can say that at least half of the materials that will be in routine use in the year 2000 do not yet exist, and that they will make up a significant percentage of industrial activity at that time.

Major Areas of Application

Paris LES ECHOS in French 30 Nov 82 p 13

[Article by Airy Routier]

[Text] The "Route du Rhum" [meaning unknown] is littered with broken masts made of carbon fiber, with dented stabilizers made of kevlar, with cracked connecting rods made of composite materials. Not to mention the sails made of ultrasophisticated synthetic textiles that hang in tatters like rags. But that does not matter. It is a fabulous test bench for new materials, a test in actual size. Commercial promotion has been guaranteed, and price-related problems are quite secondary.

In the aviation industry, things are somewhat more serious. But even there the cost of materials is secondary if the material can offer an obvious advantage in terms of resistance or weight reduction. This is in the gray area separating applied research from high-tech industry. They both speak the same language.

As soon as we come back down to earth, that is, to industry oriented toward mass consumption, materials are consumed no longer in tens of kilos but in millions of tons. And that makes all the difference in the world.

The automobile industry, acting as if nothing unusual were going on, has committed itself to a process calling for the technological renovation of its basic materials (essentially iron and steel), a process which goes beyond this industry itself. For quite some time, plastics have been used in cars, despite the nostalgia buffs who would prefer to have walnut-panelled interiors. Plastics are used primarily in the interior compartments of cars. The same is true of composites, which first appeared in 1955 in the roof of the Citroen ID-19, in the form of reinforced plastic. Today these composites are used, still by Citroen, for the hood and hatchback of the new BX. There was a revolution with the shock absorbers of the R 5, which has been followed by all the other models and manufacturers.

But the most astonishing thing is still to come: modern plastics will be used for some mechanical components as well. "Progress has been such that we have to consider the real possibility of replacing our conventional transmission systems with pinion systems made of plastic," said Francois Doubin, director of communications for the Renault group. This would be similar to the

way plastics are used in cooking robots. Some obvious benefits are: the considerable weight reduction, the silent nature of operation, and minimal lubrication (perhaps no lubrication at all would be needed).

These are very special plastics which are highly resistant and for that reason, relatively expensive. "We do have confidence in this major innovation, but we don't see any French chemical group capable of taking this process as far as it can go, and willing to invest the massive amounts of money needed in this field," complains Francois Doubin. "Will Renault have to buy its plastic gears from Japan?"

The problem is not an abstract one, and it is urgent: the magnitude of the investments demands that the automotive manufacturers engage in long-term planning of any major technological changes. Could Renault allow itself to invest in a new transmission system--which it will take 5 years to develop and which must stay in production for at least 10 years to pay off its development costs-- if suddenly everything might change? The technology used must be selected now.

"No problem," they say at Peugeot, which has just invested heavily in its Valenciennes plant, which will produce transmission systems for the entire group. "With this simpler design and increased automation of production, we have managed to cut the cost of this system 25 percent in relation to the preceding systems," claims Jean-Paul Parayre, president of the group. "Every time some new material is developed, productivity improvements made elsewhere postpone the moment when the new material will be fully competitive." Caution is valued in an industry in which any false moves can not be permitted. But such caution can become dangerous when suddenly that industry is left behind.

That is only one example among many. We know that people in the industry have great hopes placed on ceramics for increasing the heat of engines, and thus engine performance.

If there is one point on which Renault and Peugeot agree, it is that the rate of innovation of their suppliers is quite inadequate in comparison with what is going on now in the United States and Japan. "We get the feeling that we are expanding in an industrial environment that is drying up and becoming a wasteland," people are saying at Renault.

They also agree on one conviction that is quite imperialistic in tone. According to the two companies, they alone can guide

the industry in the development of new technologies. They were behind the creation of the IDECA [Institute for the Development of Automobile Components]. Renault seems to want to go even further. Concern does leave room for hope. "Certainly one of the advantages of the nationalizations is that we can work out together with other major French industrial groups our research in convergent areas, in accord with the ministry of industry," says one industrial leader. But the government's attitude is still too theoretical and not practical enough. All this is very difficult and we are in such a hurry...

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ASEA INTRODUCES NEW LINE OF WELDING ROBOTS

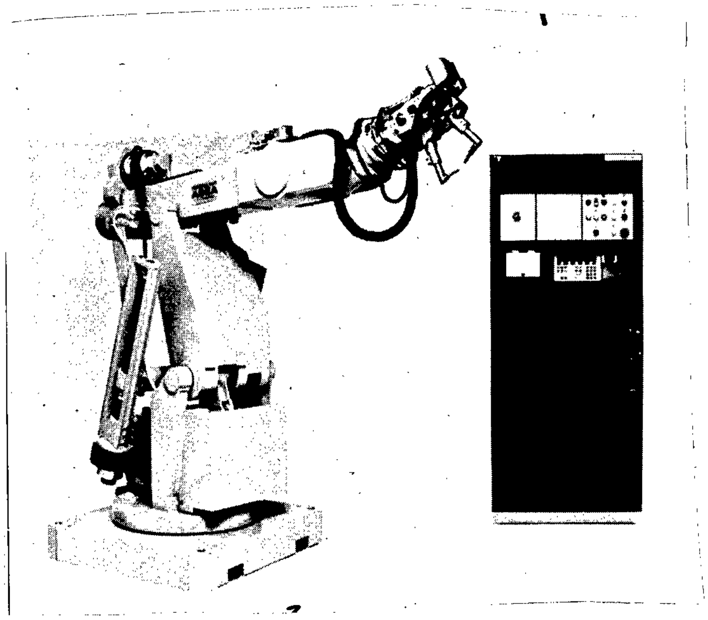
Paris LE NOUVEL AUTOMATISME in French Sep 82 pp 36, 37

[Article: "Asea IRB xy/2 Robots: Intelligent Welding"--passages enclosed in slantlines printed in italics]

[Text] /On New Year's Day 1882 Ludwig Fredhold met Jonas Wenstrom. This would be a commonplace story if it were not for the two personalities involved: three months earlier Fredhold had inaugurated the first experimental installation of Stockholm streets, which indeed he had himself initiated; and Wenstrom was a brilliant inventor of electric machines. Naturally the meeting created sparks: the Elektriska Aktiebolaget i Stockholm Company" was born one year later; in 1890 it would change its name to "Allmanna Svenska Elektriska Aktrebolaget" or ASEA for short. Today the company is called Asea AB and is still involved in the production of hydroelectric, thermoelectric and nuclear energy, of diesel power generators and power transmission systems. It also supplies extremely varied industrial equipment for mining, steel and paper pulp industries, railroads and shipping. It also manufactures electric robots./

An Easily Programmed Welding Robot

Until now the Asea line of robots consisted of the featherweight IRB-6 with a load capacity of 6 kg, and the welterweight IRB-60 able to carry 60 kg; there was also a version specialized in spot welding, the IRB60S. Asea has just announced a new line of robots, one of which is specifically designed for spot welding: these are the IRB 6/2, IRB 60/2, IRB 90S/2. This last one has a load capacity of up to 90 kg; its range is 50 percent higher than its predecessor's (IRB60S) and therefore it provides a better answer to the accessibility problems presented by the assembly of new car models. Furthermore, water, air and power supplies are integrated in the arm: no more generations of robots with dangling cables! It will now be possible to use to its full extent the increased range of the welding robot.

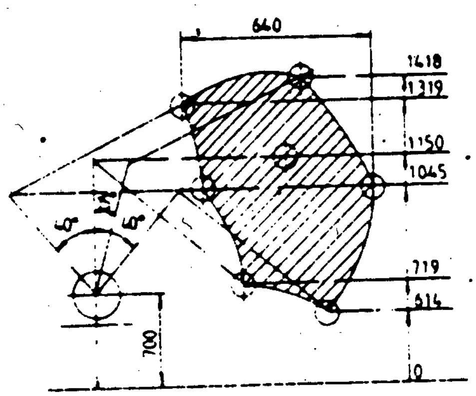


The IRB 90S/2 robot

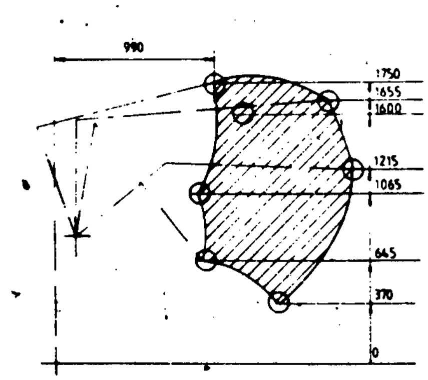
In addition, with the flexible cables of the old equipment, the electrical characteristics of cooper contacts and conductors were liable to change in time; the quality of the weldings was changing at the same time. This is not the case any more with the IRB 90S/2 robot because of the protection given by the structure in which all the power supply system is integrated.

The robots have five degrees of freedom; the IRB 90S/2 has the option of a sixth one and can also control its motions along four external axes, all synchronized with the five or six axes of the robot itself.

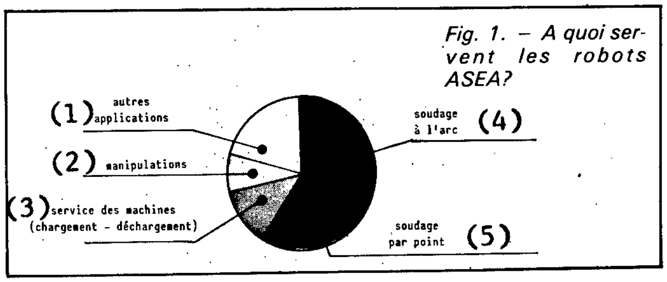
Programming is done in a conversation mode by connecting a programming unit to the robot. The control system asks questions from the operator on an alphanumeric screen; the operator answers by using specialized keys that correspond to the selected answers; the conversation is conducted in the operator's language, English, French, German or Swedish.



IRB 6/2: range of motions



IRB 60/2: range of motions



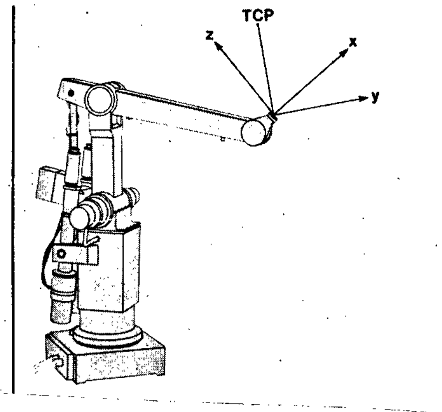


Figure 1. What are ASEA robots used for?

TCP = Tool center point

Key:

1. Other applications
2. Manipulations
3. Machine servicing (loading-unloading)
4. Arc welding
5. Spot welding

The programs can be divided into subprograms (up to 999) accessed through a main program, as in data processing; the gain is appreciable when one has to make one single program for a family of different parts. Each program step is a work command to which one may give a parameter (or argument) for position, speed, time...

There are logic commands to make conditional jumps between two addresses of the same program, pauses until a certain event occurs, interruptions depending on the presence or absence of an access signal.

Another new concept is that of the tool center point, or TCP, which is a well-defined point in space that can be moved along an axis system related to the robot's wrist; one can thus program nine tool center points. For example, the operator will fix the position and orientation of the welding tool (this will be a TCP) and he won't have to worry about the motions of the robot's various articulations to reach it.

The robot's motions can also be programmed manually through a joystick, a procedure that makes possible a gain of approximately 25 percent in the programming time.

Various editing functions are available to the operator: command modification, program replication, command simulation.

Once written the program can be stored on a floppy disk in record time, less than two seconds!

Characteristics of IRB XY/2 Robots

Portrait-robot des robots IRB XY/2

(A) **Caractéristiques mécaniques**

		IRB 6/2	IRB 60/2	IRB 90S/2
(1) Rotation du bras	(2) amplitude	340°	330°	± 135°
	vitesse maximale	95°/s	90°/s	90°/s max. 2,5 m/s
(3) Déplacement radial du bras	(4) portée maximale	fig. 2	fig. 3	− 25° − + 75°
	vitesse maximale	0,75 m/s	1,0 m/s	1,0 m/s
(5) Déplacement vertical du bras	(6) portée maximale	fig. 2	fig. 3	− 15° − + 75°
	vitesse maximale	1,1 m/s	1,5 m/s	1,5 m/s
(7) Flexion du poignet	(8) amplitude	± 90°	+ 75°, − 120°	± 120°
	vitesse	115°/s	90°/s	90°/s
		−	−	+ 120°, 90°/s
(9) Rotations du poignet		± 180°	± 180°	± 175°
		195°/s	150°/s	150°/s
(10) Nombre de degrés de liberté		5 à 6	5 à 6	5 à 6
(11) Température ambiante maximale		50 °C	50 °C	50 °C
(12) Capacité de charge (y compris la pince)		6 kg	60 kg	90 kg (5 axes) 60 kg (6 axes)
(13) Précision de répétabilité		± 0,20 mm	± 0,40 mm	± 1,0 mm

Key:

(A) Mechanical Characteristics:

(1) Arm rotation
(2) amplitude
maximum speed
(3) Radial motion of the arm
(4) maximum range
maximum speed
(5) Vertical motion of the arm
(6) maximum range
maximum speed
(7) Wrist bending
(8) amplitude
speed
(9) Wrist rotations
(10) Number of degrees of freedom
(11) Maximum ambient temperature
(12) Load capacity (including the grips)
(13) Precision of repetition

Control System:

-control by mini-computer based on 16-bit chips;
-indirect feedback programming by a console or direct through a joystick;
-programming capacity: 600 positions in the basic version; it can be expanded to 12000 positions (mass memory);
-maximum number of subprograms in memory: 999.

Power Supply:

IRB 6/2 robot approximately 2 kw; IRB 60/2 robot approximately 4 kw; IRB 90 S/2 robot approximately 7 kw.

Applications:

IRB 6/2, IRB 60/2: automation of all industrial processes.
IRB 90 S/2: spot welding.

12260
CSO: 3698/154

SCOTS COMPANY BUILDS WORLD'S LARGEST INDUSTRIAL ROBOT

Frankfurt/Main FRANKFURTER ALLEGEMEINE ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 6 Jan 83 p 7

/Article by tar: "Scots Robot for Heavy Loads"/

/Text/ The world's largest industrial robot has been manufactured by the firm Lamberton Robotics in Lanarkshire (Scotland), according to a December 1982 report in the British journal THE INDUSTRIAL ROBOT. The first in a series of robots, which will "accomplish what no robot ever has accomplished before", the Scobott 700 stands 3.35 meters high. It handles loads of up to .75 tons, moves its arm with a velocity of 1.8 meters per second, and positions itself with an accuracy of 1 millimeter. The report also states that work is now underway on an even larger Scobott 1300 with a load capacity of up to 1.3 tons.

The Scobott series was developed especially for use under rough and dangerous operating conditions and where heavy loads have to be moved with high precision at high temperatures or in a health-endangering environment. Thus, Scobott industrial robots would be primarily suited for application in heavy industry, forges, foundries, and in nuclear technology. The robots are programmed through "teach-in", i.e., through a definition of the points of motion as indicated by the machine programmer /Maschineneinsteller/ and through storing the coordinate values, combined with "textual" programming, in which programs are stored in memory and called up through the robot's control computer.

The management of Lamberton Robotics believes this is the first time that the benefits of industrial robots have been utilized for heavy industry purposes. Until now, they had been considered too "delicate" to perform such heavy tasks as, for instance, moving hot forge objects or transporting heavy forms in a foundry. Depending on equipment configuration, the Scobott robots cost between 75,000 and 150,000 pounds sterling.

7994
CSO: 3698/184

UNI-CAR UNIVERSITY RESEARCH PROJECT DESCRIBED

Duesseldorf VDI NACHRICHTEN in German 24 Sep 82 p 22

[Article by Olaf von Fersen: "The Car of Tomorrow: Four Universities Work on Research Automobile That Runs Economically and Quietly"]

[Text] While each of the three industrial enterprises, who decided to participate in the "Auto 2000" research project, was able to depart in its work from an already existing basic construction, the working group formed by the four technical universities had to start from the very beginning. This made it necessary for the "Uni-Car" developers to compromise because they had to "collect" the necessary components for the engine and drive train, and adapt them to their purposes. Thus, nothing in this vehicle is taken from existing building blocks.

The original plans envisioned only enterprises of the German automobile industry to participate in this project. However, the study group, which is made up of the Motor Vehicle Technology Institutes at the Technical Universities of Aachen, Berlin, Darmstadt, and Stuttgart, entered the picture like a somewhat uninvited guest. It submitted, however, such an interesting project that it was given the go-ahead, although there was no guarantee that it would meet the specified requirements, i.e., that the results gained from research with the vehicle could or would be used for mass production purposes.

From among the three weight classes listed in the Federal Ministry for Research and Technology's (FMRT) guidelines, the uni-team chose the medium-weight class with an empty weight of about 1,250 kg. The fact that this weight limit could not be maintained later on, was not so much due to planning and construction, but to unavoidable compromises that had to be made. These included primarily the engine, whose financing as a custom-built motor would have been impossible.

The original plans called for the use of an Audi/Volkswagen engine. Uni-Car planners then wanted to make the necessary modifications, as required, in a diesel engine used in the program. Since this proposal was not well received in Wolfsburg, they approached MAN with the request to develop a suitable direct-fuel-injection and turbo-charged diesel engine.

The point of departure was a Citroen four-cylinder engine with 2.5 liter displacement, of which, however, only the cylinder block and the crankshaft were ultimately used. For this base, a light-metal cylinder head was developed with an overhead camshaft. The vertical valves are actuated by cup tappets; they are driven by a toothed beltdrive in two steps. Pivot nozzles located at an angle in the cylinderhead inject the fuel directly into spherical combustion hollows at the bottom part of the pistons, where the injected jet is dispersed in the air.

The original plan to install the motor transversely in the front of the car fell victim to two obstacles: the width of the engine would have restricted the turning angle of the wheels, and the cylinderhead would have taken up the very space needed for the deformation zone of the hood in order to protect pedestrians. Therefore, the plans were changed so as to provide for the longitudinal installation of the engine, that is, with a 45-degree incline of the cylinder block to the left to save space and with a 6-degree tilt towards the front.

Space limitation under the hood was also the reason for the two-step camshaft drive. The camshaft of the Citroen engine, located at the side, whose rear portion drives the waterpump and the electrical generator, carried at the front the intermediate wheel, whose outer tooth rim drives both the (now smaller) camshaft wheel and the injection pump via a long belt. In addition to the intermediate wheel, the toothed belt, in the first stage, also operated the oil pump.

The overall length that is required for the cupped pistons made it necessary to shorten the piston rod by 6 mm. The space required for the differential and the driveshaft led to the development of a costly type of a light-metal oilpan. In the end, the engine turned out to be somewhat heavier than originally planned, or heavier than if it had been built from scratch: by about 200 kg. To meet the driving performance requirements laid out in the specifications, the diesel engine had to be charged. For this purpose, a turbocharger and a compression-wave charger "Comprex" (by BBC [Brown Bovery]) were to be examined as to their suitability. Also considered was an additional separate drive for the charger in order to achieve better acceleration. Cuts in FMRT funds made it necessary to limit it to an exhaust gas turbocharger, for which a charger manufactured by Garrett was chosen. By yearend 1981, a total of seven engines had been built for test-stand experiments and further development.

For power transmission, a continuously variable automatic transmission (CTV) with hydrodynamic start-coupling was selected. The transmission in question is known as a design manufactured under the name of "Transmatic" by the Van Doorne Transmissie BV in Tilburg. Here, transmission action is provided by a steel-link band moving between two conical discs. Furthermore, there are a small planetary gear train to reverse the direction of rotation for backward motion and a gear pair to reduce the speed of rotation. By pulling the conical discs apart or moving them closer together, different stages of motion can be achieved, permitting a transmission ratio of between 2.646 and .378. An electronic mechanism to control the engine power and transmission permits optimal economical efficiency. The hydrodynamic coupling has a lock which is automatically activated at a driving speed of between 15-30 km per hour.

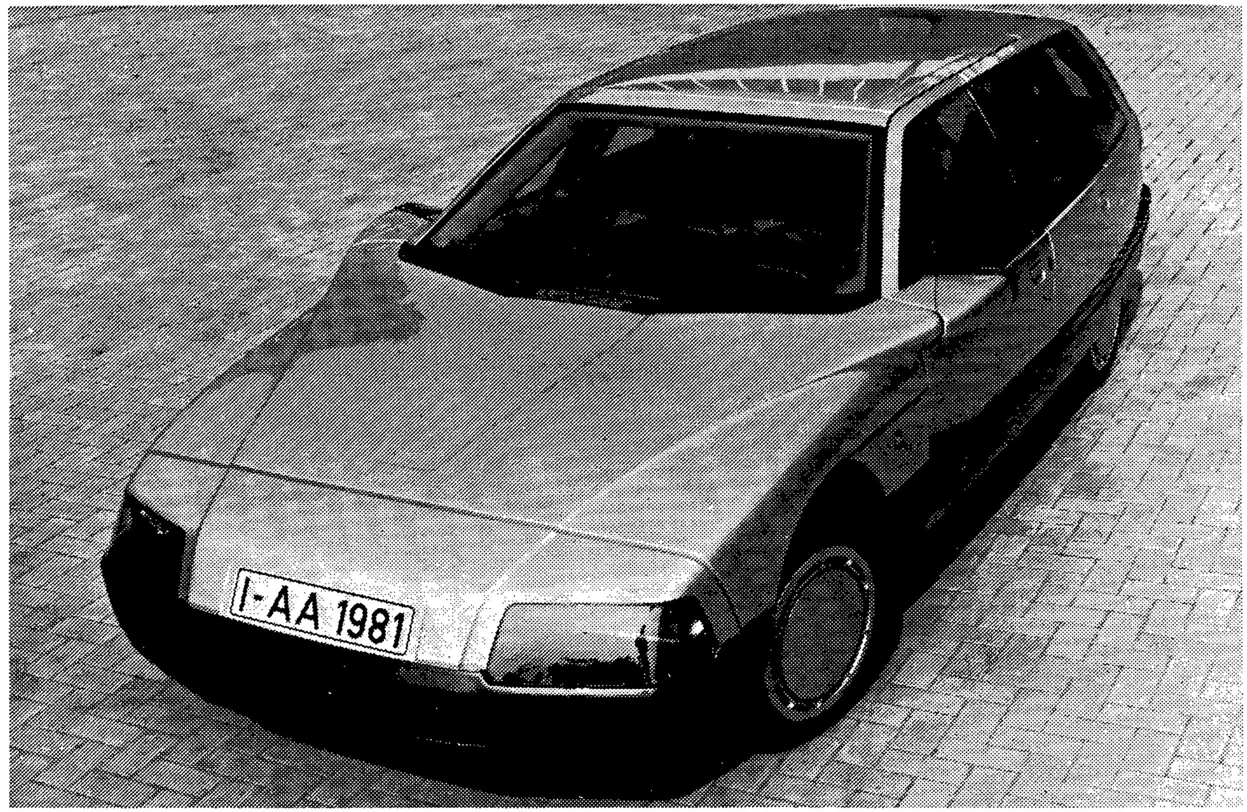
The motion of the car is controlled by an intelligent electronic system. The "gas pedal" actuated by the driver, is no longer mechanically connected to the injection pump; it merely informs the electronic controls of the driver's intention through a potentio-meter. Respective inputs to the electronic control device come from a rotational speed sensor, from sensors of transmission input and output of the link chain, from the transmission lever, and from a brake pedal switch. Control impulses are being sent to the injection pump and to the adjustment mechanism of the transmission. In both cases, servomotors are used to carry out the control commands. During the startup phase, the electronic devices adjust a torque sequence which ensures a smooth transition between coupling and "lockup" operations, even under conditions of heavy acceleration. The engine performance characteristics stored in the control device and detailed control strategy ensure coordination of motor and transmission in the most economical manner possible.

During braking, the injection pump automatically returns to zero, and the transmission adjusts the motor revolutions in a way that brings about braking. From the differential gear, located sideways underneath the engine, a short encapsulated shaft extends below the motor. This permitted an arrangement of drive shafts of equal length.

The front wheels of the Uni-Car are operated by a long and short-arm suspension, and the rear wheels by a coupling guide axle [Koppellenkerachse]. Different suspension systems are used for the front and rear wheels: the front wheels have space-saving truncated-cone coil springs; the rear wheels have pnuematic pressurized suspensions which are load-dependent. The latter are a contribution of Prof Dr Ing Gold's Engineering Buero, Bingen. They consist of sheet-metal canisters with two spaces of different size, two rolling bellows, and a piston. Damping is done by integrated dampers; and levels are controlled by pumping in or by letting out air. These GFD spring elements are more sensitive than hydropneumatic spring systems and they are also considerably lighter. The loaded vehicle sways no more than an empty one and load additions do not diminish spring action comfort. In order to cut down on weight, the front lateral steering arms are made of aluminum.

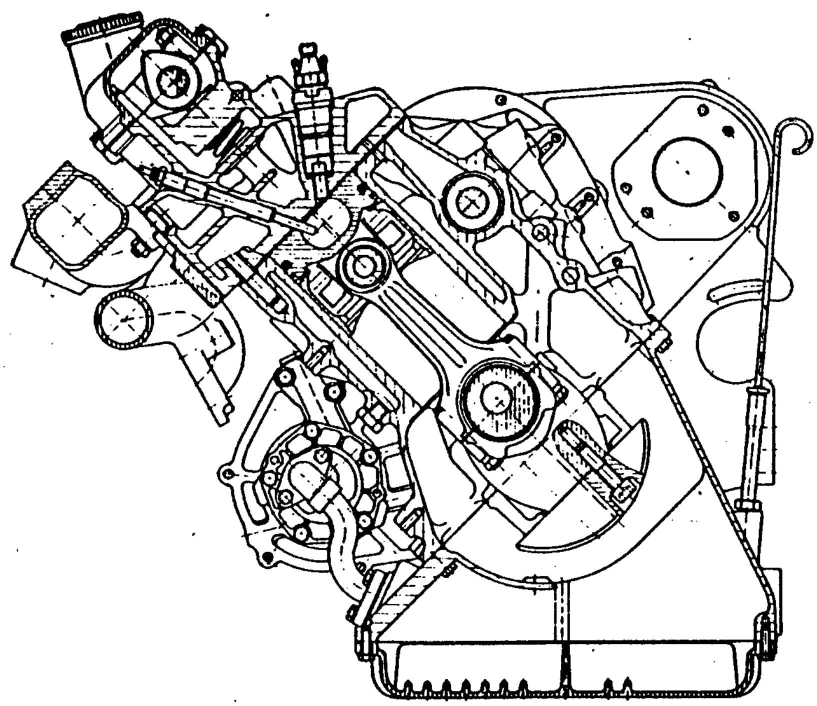
The steering geometry was designed for a roll radius of zero which allows the diagonal division of the two hydraulic brake circuits. All four wheels carry Girling brakes, and the brake disks of the front wheels have internal air vents. The brake indludes a storage brake pressure amplifier [Speicher-Brems-Kraftverstaerker] and a blocking protection device [Blockierschutzvorrichtung].

The spherical planetary gear steering drive [Kugelumlauf-Lenkgetriebe] has a transmission ratio of between 1:13 and 1:15.5, which is a function of the steering angle. It also has velocity-dependent power steering assist. The only Uni-Car built so far rolls on BBS light-metal wheels with split rims and wheel-covers to reduce air resistance. The tire size is 195/65 HR 15, made by Goodyear. They are safety tires with emergency running features and air-pressure monitoring. A spare wheel is not provided in the Uni-Car.



The university working group's final product is quite an attractive automobile. The photograph shows the front air escape of the engine enclosure in the front edge of the driver's door.

No modified ready-made parts could be used for the construction of the car body. Thus, the largest single item of total investment expenditures was for the design, construction, and fitting of the body. That amounted to approximately DM 12.6 million, out of a total of DM 33.5 million. The work had to be contracted out. It was carried out by the firms Wilhelm Karmann GmbH and Italdesign (Giugiaro/Italy), who have been collaborating on specific projects for a number of years. The design of the car body depended on several basic requirements, which were based on the original concept. The decision in favor of a front wheel drive, a good aerodynamic shape, and integrated safety features, resulted in a four-door sedan, with a strongly rounded front, sidewalls drawn in towards the rear, and a steep rear section. The designers chose different wheel track widths: 1,500 mm for the front wheels and 1,410 mm for the rear wheels. The wheel base of 2,750 mm ensures ample interior space; the rather long overall length, 4,650 mm, is to a considerable extent due to the pedestrian-friendly design of the car and the crushability of the car front. The load-bearing structure of the front section of the car consists of two pairs of longitudinal beams, with the lower ones forked in the cowl area. Their arms are supported at the central tunnel and at the foot of the A column; the upper carriers are also supported by the A column, and in addition by the very strong transverse beam supporting the windshield.



Cross-section of the direct fuel injection diesel: the engine provides 72 kilowatt at a compression ratio of 17:1 and a nominal number of revolutions of 4,300 min^{-1}. Maximum torque is 185 Nm at 2,800 min^{-1}.

Safety Considerations Determined Car Front Design

The design of the front section of the Uni-Car is primarily determined by safety considerations. The "soft nose" consists of a basic body of polyurethane foam, covered by an integral foam skin. The airduct, which leads through the soft front to the radiator, was shaped to serve as a "sound barrier." The front, entirely made of plastic, is mounted on a carrier plate and weighs about 16 kg. It can absorb the energy of an 8 km-per-hour impact without permanent deformation. The carrier plate also supports the headlights. There is no front bumper in the usual sense. The surface of the hood is made of sheet aluminum, which is padded with a 30-50 mm-thick layer of foam. On top of this is a stabilizing thin layer of glass fiber/plastic, and this, in turn, is covered by an outer skin consisting of integral foam. The windshield as well is connected, in an elastic way, to the steel frame, through a glued-on intermediate layer of integral foam. The central space was particularly well strengthened. First, by way of a lateral beam between the B columns and secondly, through two steel sections in the doors, so arranged that one is above the other. Hinges and hooks link these transverse members to the columns. Even a direct hit in the door center cannot penetrate into the car interior. The transverse walls serve both to anchor the seats and to support the safety belts. This made it possible to move the shoulder points of the belts towards the inside. The rear seat can be tilted forward in two parts so as to enlarge, if necessary, the load space that is accessible through the rear door.

To reduce the noise level, the mechanical parts were fully enclosed. Air entering through the radiator grill can escape through two outlets behind the front wheels or through a central duct in the bottom of the vehicle. This duct also contains the exhaust mechanism and, for that reason, is outfitted with sound and heat insulation stretching over its entire length.

Consumption of 6.55 Liters of Gasoline Mixture Per 100 KM is Far Below Specifications

The guidelines of the FMRT specification envisioned for a category II research car a useful load capacity of 400 kg, an acceleration time from zero to 100 km per hour, and a mixed-gas consumption of 9.5 liters per 100 km (city cycle 50 percent; 90 km per hour 25 percent; and 120 km per hour 25 percent) as well as pollutant emissions that are more favorable than the values prescribed by the Federal Office for the Environment for 1982; and noise emission not exceeding 73 decibels (A).

To obtain the stipulated driving performance and fuel consumption goals, the body had to be designed for minimum air resistance. The uni-stylists have tackled their job with great thoroughness. The cooling air currents were carefully analyzed; the body was given a closed, completely level bottom; headlights, door handles, and impact areas are flush with the outer skin of the body; and the areas between the outer skin and glass areas show only minimal "terracing" [Abstufungen]. The two outside mirrors were covered in line with aerodynamic considerations. However, this increased the width of the vehicle to 1,980 mm.

The first wind-tunnel tests were done with a 1:5 model and, when the optimal form was found, work was continued on a full-size model. In the final phase, a resistance coefficient of c_W=0.226 was established for the large model, which later decreased somewhat to c_W=0.24 for the completed Uni-Car. The prescribed acceleration time was more or less attained; the maximum speed, with about 190 km per hour was exceeded by a considerable margin. The fuel consumption of 6.55 liters per 100 km remained considerably below BMTF requirements (constant 90 km per hour 4.6 liters; 120 km per hour 6 liters; city traffic 7.8 liters). While the empty weight of 1,375 kg exceeded the specified requirement, it was possible to obtain a higher useful load than prescribed--450 kg.

Like other research automobiles, the Uni-Car has many electronic parts. Its on-board net consists of a conventional cable harness and also of a multiplex system. Over 100 of the approximately 500 lines are used for electronic systems, with the "management" of motor and transmission being the central unit. Novel is also the layout of the display and monitoring instruments. Only vehicle speed, water temperature, tank contents, and fuel consumption are constantly indicated by light-emitting diodes. Speed is indicated as a circular luminous band directly within view of the driver. In addition, the instrument panel carries the usual warning lights as well as a central light for the monitoring system. The entire instrument system is connected to the steering column support and can be adjusted to it in height.

The university working group is the only project partner that continues to receive funds from the FMRT--although on a more modest scale--to pursue its work on the Uni-Car. A second car is now under construction, in addition to the first car; however, it does not have the elegant interior. Whether or not any more cars will be build, say for crash tests, will depend on FMRT willingness to provide additional funding.

Prof Dr Ing Bert Breuer of the Darmstadt Technical University, who is in charge of the Uni-Car project, underlined the importance of the Uni-Car project for the participating universities, "... it constitutes a very strong motivational force for all students and scientific collaborators involved. Here, for a change, something concrete has been developed, which otherwise may have rotted away as a good idea in the archives of university professors."

7994
CSO: 3698/150

FIAT'S MODULAR 'VSS' RESEARCH AUTOMOBILE DESCRIBED

Duesseldorf VDI NACHRICHTEN in German 29 Oct 82 p 22

[Article by Olaf von Fersen: "Modules Open Up a Variety of Models. The Car of Tomorrow: Synthetics Put Their Stamp of Fiat's Forward-Looking VSS Study"]

[Text] Naturally Fiat is engaged in projects for the future, but in a different way from the German car manufacturers. The "VSS" (Modular Experimental Car) is a drivable car in the lower average class of the size of Fiat's Ritmo. It was built modularly so as to allow exchange of individual subassemblies, thereby permitting different body variants to be assembled from the same basic underbody, running gear and drive.

Experts from other areas such as architects, structural engineers and urban developers participated in the future car project. In setting the objectives they were less concerned with the manufacture of the prototype of a future Fiat model than with the testing of new techniques and manufacturing processes. Among other things they had in mind the highly decentralized production of subassemblies which--like an erector set system--could be assembled into the models desired in each case. For the VSS project (Modular Experimental Car--experimental car assembled from subassemblies) they concentrated on the body, whereas existing units from the Ritmo production line were used for the mechanical components.

The concept selected consists of a three-dimensional cage of box-shaped sections for whose central part galvanized sheet steel was chosen. This cage encloses the interior space as a protective cell. Its central door posts are connected above by a strong roll-over hoop. The front end holds the drive and also contains the support bearings for the front struts of the running gear. The entire structure was calculated by the method of finite elements and also was made to conform to the requirements of passive safety. With minimum weight the cage achieves the same bending strength as the conventional sheet steel body.

Large Synthetic Parts Make Up the Shell of the Body

The body shell for the frame is made up of large-area synthetic parts. Several international chemical companies did substantial work on their

design. These elements are designed for automated assembly. They are bolted to the supporting cage, with the fasteners arranged to be conveniently accessible before mounting the next part. The components of the shell can either be painted before assembly, or the body can first be completely assembled and then painted--to the extent that synthetic parts dyed throughout are not used. If the VSS body were assembled by the conventional method, 5 work hours could be saved as compared with the Ritmo.

Different synthetic parts afford the possibility, while using the same understructure, of producing different bodies--eventually also using different materials and assembly processes. In this way it would be possible to produce not only fastback but also notchback sedans or station wagons.

This type of body manufacturing has a number of attactive possibilities. Thus, the cage could remain unchanged throughout a long production period; at model changes it could merely be provided with a different shell, without having to incur high capital costs for new pressing dies. Moreover, synthetics can be used to produce shapes which cannot be made with sheet steel. For production in a foreign assembly plant, considerable savings can be achieved on transportation and probably on local wages as well.

The car body of the VSS is about 20 percent lighter than the mass-produced Ritmo; also, synthetics are essentially corrosion-resistant. According to the views of Fiat engineers the method of construction of the VSS body guarantees a durability of at least 20 years. An additional advantage is improved noise insulation. Many of the concepts realized in the VSS could be introduced into mass production in the short term, and Fiat plans to do this.

The synthetic components which are bolted to the steel structure are limited in number, and a few of them are consequently quite expensive. This goes for the front part, the radiator grille, the ventilation air ducts and the headlight supports.

These parts made of polycarbonate are bolted to the steel structure. The front bumper as well is made of polycarbonate. It is connected with the frame by means of elastic parts, which in case of a slight impact thus protect the body from damage. The engine hood and the interior walls of the wheel housings in turn form a unit which also includes the upper parts of the front side members. This unit weighs 12 kilograms and is made of glass-fiber-reinforced polyester foam. The same formed body made of sheet steel would weigh an additional 5 kilograms.

Each door is made of an inner and outer shell of glass-fiber-reinforced synthetics which are glued together. Between the shells there is a steel member which supports the mechanical parts--window opener, lock and inside door handle support gears--and gives everything in the area of the hinges the required stability.

Inasmuch as the cage structure ends in the area of the rear seat back rest, the configuration for the rear of the car is open. For the VSS different possibilities were developed in which luggage compartment floor, cross member and rear bumper are made of polycarbonate and the rear fenders of glass-fiber-reinforced synthetics. These parts and the real lights unit are glued to the steel cage before assembly and are bolted as a complete formed body to the frame lattice.

The Roof Is Made of Polyester Foam

The particular structure and shape of the rear of the vehicle required a new design for the rear wheel alignment and suspension, no part of which was to protrude into the luggage compartment. A 3-millimeter-thick polyester foam layer was chosen for the roof which is glued to a honeycomb structure. This design, while having good stability, has much better insulation than the usual design.

The Fiat VSS research car has a wheelbase of 2448 millimeters and track of 1410/1390 millimeters. It is 3853 millimeters long (in the four-door fastback sedan), 1650 millimeters wide and 1395 millimeters high. As compared with the Ritmo of approximately equal size, the body of the VSS is 21.3 percent lighter. The greatest weight advantage was achieved for the front doors: instead of 43.66 kilograms they weigh only 29.80 kilograms for the VSS, that is, 13.86 kilograms less or a gain of 31.8 percent.

In endeavoring to achieve particularly good acoustic and thermal insulation of the passenger compartment from the engine compartment, the researchers had a new idea. A case for the spare wheel was included in the heating/ventilating subassembly.

Division of the synthetic parts into individual subassemblies with as much integration as possible allows pre-assembly of eventual additions and build-ins; moreover, it offers entirely new ways of producing different modules for the basic structure or of allowing these to be supplied by subcontractors, with whose help it is possible to bolt together highly different model variations without requiring any changes in the basic structure.

Inasmuch as Fiat plans to introduce many of the concepts realized in the VSS into mass production, one must await the time when a report can be made on this.

5586
CSO: 3698/202

MITTERRAND COMMENTS ON AIRBUS SLUMP, FITERMAN OPTIMISTIC

Paris LE MONDE in French 28 Jan 83 pp 1, 10

[Article: "The Airbus Slump: Head of AEROSPATIALE Blames FRG"]

[Text] In a letter he has just addressed to various governmental authorities, the president and general manager of SNIAS [National Industrial Aerospace Company (also known as AEROSPATIALE)], Gen Jacques Mitterrand, invites the attention of the addressees to the "disturbing" marketing situation of the European Airbus plane. "The 1982 balance sheet is, in fact, negative," he writes, after pointing out that contracts ending up [for the year] canceled or delayed by the airline companies have outnumbered those ending up as firm orders. By the end of 1983, there will still be 21 unsold planes out of 282 Airbuses produced, and by the end of 1985 the figures will probably be 78 unsold planes out of a total production of 407.

General Mitterrand feels that the FRG [Federal Republic of Germany]--whose banks are declining to "take risks on companies or countries in precarious financial health"--is for the most part responsible for the collapse of the Airbus program's 1982 marketing situation. He proposes forming a tripartite group--France, FRG and the United Kingdom--"to take urgently the steps needed to get planes out on the market during this critical period, which it is to be hoped will not be of long duration."

The recipient of this document, Mr Charles Fiterman, minister of transportation, referred to the fact, on Wednesday 26 January, that he is in favor of launching the Airbus A-320 version. The president and general manager of SNIAS, in his letter of 3 pages accompanied by several annexes, totaling 18 pages, states that "The situation at the start of 1983 is disturbing," and that "There is reason to fear that it will continue so to the end of 1983 and perhaps even into early 1984."

For the first time in the 12 years of the Airbus A-300 program's existence, the firm orders booked to the end of 1982 totaled 12 planes less than the number booked to the end of 1981: In fact, the number of orders for the year 1982 (9 planes) is less than the number of contract cancellations (11 planes), bringing the total number of Airbuses sold to 331 planes. "After a string of remarkable successes since 1978," writes the brother of the president of

the Republic in his letter to the French Government, "Airbus sales slumped in 1982." Cancellations of orders; requests from client companies that deliveries be delayed; competition from Boeing "on all fronts, with attractive propositions."

"Current production is not fully sold, and the number of planes in stock will increase in 1983," observes General Mitterrand, who places at 7, today, the projected number of unsold Airbuses by the end of 1982. "As of today," he writes, "21 of the planes to be produced through the end of 1983 are still unsold," and "It is not at all impossible that certain contracts considered sure as of today could become doubtful in the weeks or months ahead, if the situation of the airline companies continues to deteriorate."

Without counting the planes sold under option contracts merely deemed "credible" or those sold but whose financing has not yet been worked out, there will be a sales shortfall of 21 Airbuses in 1983, 41 in 1984, and 78 in 1985, adding up to over 19 percent of a production that will total 407 Airbuses by the end of the latter year.

"If new sales are not made," General Mitterrand concludes, "our production program will have to be revised downward." Whereas, as of the end of 1981, projections called for a rapid production-rate rise to 8 planes per month in 1984 and 8.6 percent in 1985, the most recent production plan, approved at the end of 1982, calls for a leveling off of monthly production at 6 per month after 1984.

Meanwhile, says the president and general manager of SNIAS, "It is indispensable that (the European consortium) Airbus Industrie be able to offer terms and conditions, to the few companies still wanting to buy planes, at least equivalent to those being offered by the competition. This requires an extremely active participation by the financial institutions of all the partner countries. Although France is ready and willing to do this, the same cannot be said of Great Britain and, above all, of the FRG. In the latter country, not only is the will to do so lacking but, above all, the system itself runs counter to doing so."

Doubts

In support of this statement, General Mitterrand cites "the list of transactions that is currently stalemated by the restrictive position of the Germans," involving over 40 planes, if one totals up the number of transactions that are posing financing problems.

"This situation, besides creating problems for us as of now, also gives rise to doubts among the partner countries and is unquestionably applying a brake to the launching of the new A-320 program," observes the president and general manager of SNIAS.

Powered by two CFM 56-4 jet engines designed by the Franco-American consortium SNECMA [National Aircraft Engine Study and Manufacturing Company]-

General Electric, this 150-passenger, short-/medium-range airliner A-320 is designed to replace the Boeing 727 Boeing 737, Douglas DC-9, Caravelle and BAC-111. The cost of this program, based on 1982 economic conditions, is estimated at around $1.85 billion (that is, on the order of 10.8 billion francs). "The decision to launch this program," General Mitterrand states, "could take place in the second half of this year, an initial flight in the spring of 1987 and the putting of the plane into service in the spring of 1988."

Critical Phase

In his letter to the governmental authorities, the brother of the chief of state has not limited himself to his concerns for the future of the Airbus A-320, which is still in suspense as of the date of this article. He has also taken the opportunity to point out the existence of another projected plane, which has been baptized the A-310-300 by the designers.

This is a new version of the Airbus A-310, a twin-engined jetliner capable of carrying 215 passengers over distances of 5,500 kilometers, which made its first flight in April 1982, for delivery to client airline companies beginning this April.

General Mitterrand points out that its American competitor, the Boeing 767, "has the advantage of a longer operating range," and that "the airline companies are showing increasingly greater interest in longer operating ranges."

"To hold on to a sufficiently large share of the the market," he adds, "we need to develop a version with an extended operating range, namely, the A-300-310," the prototype of which should be flying by July 1985. The range must be increased by around 1,500 km. This will require of Airbus investors an additional expenditure of $180 million (1.1 billion francs), close to one-third of which would have to be provided by France.

"As much to resolve current problems as to ensure the long term, everything must be done to get planes moving out into the marketplace in the present critical phase (...). It appears to me necessary," General Mitterrand concludes, "that the policy-making and administrative authorities of the three partner countries strengthen their cooperation, especially with regard to the financing of sales, which in Great Britain and, above all, in the FRG, is not being accorded the needed priority."

In aeronautical circles, it is being hinted that the proposal of the president and general manager of SNIAS, calling for the forming of a group of "high-level" representatives of the three governments concerned and vesting it with "a very extensive power of decision," to examine the future of the Airbus, has met with approval on principle by the French authorities.

Mr Fiterman: The A-320 Must Be Built Within Shortened Delivery Times

"We consider the Airbus A-320 program to be solid and are prepared to do whatever is necessary to ensure the building of this plane within shortened

delivery times," affirmed Mr Charles Fiterman, minister of transportation, on Wednesday 24 January, before the Aeronautics and Space Public Relations Association. Asked about the hesitancies and doubts this program sometimes raises, the minister replied that "This is a domain in which a very hard psychological war is being waged," and in which "tendentious reports are being spread by irresponsible sources."

The choice of an engine last month has, according to the minister, removed the last remaining obstacle to the building of the plane. The financing of the undertaking, he said, poses "no difficult problem." "Together with France, which has made its position known, other parties have also taken a favorable position with regard to the financing. The British have even indicated they are prepared to go beyond their present level of participation in current programs."

Mr Fiterman also referred to the possibility of bringing new partners--Canadian (de Havilland), Dutch (Fokker), and Italian (Aeritalia)--into the actualization of the A-320. And, if necessary, France is prepared to raise its level of participation in the program, in accordance with the Government's commitment of the past almost 2 years in this respect. "It is a fall-back to which, in my opinion, it will not be necessary to resort," Mr Fiterman added, convinced that "There are customers for the A-320" and that "There is a risk of an overflow of them." In his view, the niche it will fill is a promising one despite the difficult situation: "I have heard it said that this project is the best there is between now and the year 2000," he said.

[Boxed insert by Jacques Isnard: "Responsibility" follows]

Planes, at $50 million each, in stock, the immobilization of which carries the risk of incurring very heavy costs--for debt service--to the point of again plunging SNIAS into new indebtedness. Monthly production rates unquestionably too accelerated for the past several years now, and maintained despite obvious signs of shortness of breath of the international civil aviation market. Airbus models, like the B-4, on the one hand, built in too large a production-line quantity, and like the A-300-600, on the other hand, a new model that is having trouble penetrating the market.

Although there has been too optimistic an assessment of the needs of the clientele, the responsibility is not that of the Airbus Industrie GIE [Economic Interest Group] alone. It also goes back to the French, West German and British industrialists, who are more than mere subcontractors of the European consortium and who should have monitored the activity more closely and on a regular basis, since each of them delegates a general manager to this task in an executive committee.

Now, the political authorities are being asked to bring their full weight to bear on the resolution of a crisis that is at one and the same time technical, commercial and financial, and that it is hoped will be short-lived. The stakes involved, it is claimed, are the credibility and prestige of the other

products yet to come and deriving from the Airbus. And it is true indeed that the launching of the A-320 program, which Mr Fiterman has reminded us has his full support, will eventually depend on whether or not the sales of other Airbus models abroad make an honorable showing.

Even though the image of the trademark of this line of planes might have to suffer for it, and even though this solution is not a panacea, why not try leasing the unsold planes? Other American builders have already adopted this approach, which is somewhat one of despair. Rather than seeking on whom to cast blame--in this case, across the Rhine--the industrialists should face the painful choices that lie ahead of them today if the worldwide recession persists: That of having to scale down the production rate in 1984 and beyond, with the risks this involves of a reduction of staffs and working hours; or that of having to sell off the planes taking deep losses on their prices, as, for example, Boeing has already done.

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TRANSPORTATION

AIRBUS RUDDER UNIT PRODUCT OF STUDY, TESTS, ADVANCED MANUFACTURING

Duesseldorf VDI NACHRICHTEN in German, 5 Nov 82 p 21

[Article: "Carbon Fiber-Reinforced Plastic Components Are Made in a Carbon Fiber-Reinforced Plastics Device"]

[Text] A 13.7 m by 4.1 m joining dish of carbon-fiber reinforced plastic (CFK) is currently being installed at Messerschmitt-Bölkow-Blohm (MBB) in the Division of Transport and Commercial Aircraft in Hamburg. The device should serve both for the production of the complete primary structure of an Airbus rudder assembly and also the large components of the rudder assembly central-case and for the implementation of static and dynamic investigations.

According to MBB it has provided "notable interim results" not only in the building and testing of the actual assembly components, but also in tool development. After static tests had begun in September with the first complete section of the central case, additional considerations were made on the development of special devices for using the new technology. These special devices will be made of CFK and of resins developed specifically for the intended purpose.

The necessity for using CFK here too, results from the production run, which is explained by the company as follows: Basic building blocks for each component are modules which consist of one or more layers of resin-saturated reinforcing fabric.

These are wound around an aluminum core and are shaped in this manner until hardened in an autoclave. On the joining dish the modules are held exactly in the prescribed position by means of a model-frame. For instance, in the future in one step in an autoclave an 8 m-tall rudder assembly for the Airbus rudder can be baked from 256 shaped components and metal-covered sheets using one-shot bonding. Next, the aluminum shaping-core is removed from the CFK components. To produce certain module cores, a new method was developed which uses the graphic data processing system CADAM. Thus the production costs for around 80 percent of the module cores can be reduced by about 40 percent.

Flight Operation Proves Material Strength

The use of CFK as building material for the Airbus rudder assembly whose weight in aluminum is about 1.2 t, brings a weight savings of 20 percent. The resistance of this material has already been demonstrated on a rudder assembly--on the moving part of the tail plane. After these encouraging results it was suggested to test the potential uses of this composite material for the rudder assembly central-

case, that is, for the supporting structure. The fact that these development efforts are being supported financially by the Federal Ministry for Research and Development (BMFT) underlines their significance for aircraft construction.

Besides the development of the prototype of a wrapping system which in principle meets the requirements of future series production concepts, important progress was made in the development of tools whose result--according to the definition of special resins--is the two joining dishes of the CFK device. By means of this unit, a rudder assembly central-case is being produced which will be subjected to static and dynamic tests in 1984.

The advantages of this CFK-alternative are significant: Instead of the previous metal construction for the supporting structure of the Airbus rudder assembly which consists of 2000 riveted parts, now a CFK structure made of only 98 parts plus rivets will be used. In addition, carbon fiber-reinforced plastic saves energy because it stores less heat than metal. Tools made of CFK thus expand under heat nearly the same amount as the component. The approximately 45 percent lower weight compared to metal, simplifies handling of the tools. The excellent surface characteristics of CFK renders the use of highly polished special sheet metal superfluous.

In spite of these notable advantages, the use of CFK tools is prohibited today for cost reasons in other areas of CFK-component manufacture. But this method does indicate that this new technology will take the first steps on the way toward an important change in aircraft manufacture.

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'SUPER-INTERCITY' HIGH-SPEED TRAIN PLANNED FOR 1985-87

Dusseldorf VDI NACHRICHTEN in German, 12 Nov 82 p 26

[Article: Railcar Construction Industry Plans Super-Intercity Train]

[Text] The German railcar-building industry has become the leader in the development of a future-oriented "high-speed excursion train." In Munich recently an 8 m-long section in original scale was presented with its complete equipment.

It is intended to begin the building of a "wheel/rail test and demonstration train" (R/S VD) which will consist of two engine units and two intermediate cars at first, to be expanded later to eight railcars. The costs amounting to about DM 60 million will be borne half by the Federal Ministry for Research and Technology (BMFT) and the rest by industry and the German Federal Railroad (DB). In this sphere the financing has not been fully guaranteed. The Federal Railroad Central Office in Munich is assuming however, that the R/S VD can be completed by the end of 1984/beginning of 1985, but at the latest for the 150th anniversary of the German Railroad in December 1985.

The development of the new Super-Intercity shall be persued parallel with the building of the new rail lines of the federal rail network. The R/S VD is a precursor of the prototype which could appear from 1985 to 1987 so that by the beginning of the 1990s the railroad system of the next generation could be in series production. Industry thus hopes to solidify its competitive position compared to the rail systems of other countries and thus this new development is not aimed solely at uses in the FRG, but also for the world market. The railcar model was designed by Messerschmidt-Bölkow-Blohm.

PHOTO CAPTIONS

1. p 26. The Preliminary 1:20-Scale Model of the Super-Intercity 300 km/h Train. A Railcar Model of the "Train of the Next Generation" was recently produced in original scale for demonstration purposes.

2. p 26. View of the interior of the Railcar Model shows passenger comfort; in Second-Class there are two seats on either side of the aisle, in First-Class, only one seat on each side.

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TRANSPORTATION

BRIEFS

ROLLS ROYCE ENGINE STUDY--Rolls Royce announced in mid-November that it would start on a study of a new fan engine for smaller transport planes as well as larger business jets. The new engine, which bears the designation RB183-03, would use at least 10 percent less fuel during normal flight operations than the RB183-MK555, which is currently used in the Fokker F28. The new engine will have a bypass ratio of 3:1 and will distinguish itself by a significant reduction in the noise level. The development of the new engine is based on experience gained from 5,000 engines of the RB183 and Spey family. More than 1,400 of these engines have been ordered for the Fokker F28 and for Gulfstream II and III business jets. /Text/ /Gelsenkirchen AEROKURIER in German Dec 82 p 1348/ 7994

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